



**National Aeronautics and Space Administration  
Goddard Space Flight Center  
Wallops Flight Facility**

**Project Plan**

for

**Norway 2014**

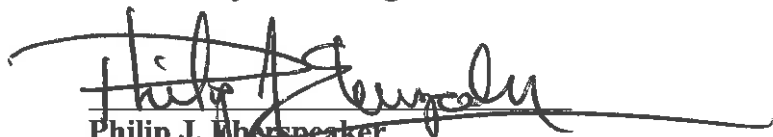
October 9, 2014




Libby West

SRPO Projects Manager, WFF

10/21/14  
Date

  
Philip J. Morespeaker  
Chief, Sounding Rocket Office, WFF

10-21-14  
Date

  
Glen Liebig  
Chief, Safety Office, WFF

10-23-14  
Date





<b>1.0</b>	<b>PART 1: PROJECT OVERVIEW .....</b>	<b>1</b>
1.1	Introduction.....	1
1.2	Objectives .....	2
1.3	Mission Description.....	3
1.4	Customer and Stakeholder Definition and Advocacy.....	4
1.5	Project Authority.....	5
1.6	Management.....	5
	1.6.1 Roles and Responsibilities .....	7
	1.6.2 Management Oversight.....	10
1.7	Governance Structure.....	10
1.8	Project Requirements.....	10
1.9	Technical Summary .....	11
	1.9.1 Project Level Documentation .....	12
	1.9.2 System Constraints .....	13
	1.9.3 Facilities and Ground Support .....	13
	1.9.4 Data Products and Distributions .....	13
1.10	Implementation Approach .....	14
1.11	Program/Project Dependencies.....	14
1.12	Logistics.....	14
<b>2.0</b>	<b>PART 2: PROJECT BASELINE .....</b>	<b>15</b>
2.1	Schedules .....	15
2.2	Resources .....	15
2.3	Acquisition Management.....	16
2.4	Performance .....	16
<b>3.0</b>	<b>PART III: SUBPLANS .....</b>	<b>17</b>
3.1	Communications Plan.....	17
3.2	Control Plan .....	17
3.3	Risk Management Plan .....	17
3.4	Technology Strategy or Insertions.....	19
3.5	Cooperation and Commercialization .....	19
3.6	Safety and Mission Success Plan.....	20
3.7	Environmental Management Plan.....	21
3.8	Systems Engineering Plan.....	21
3.9	Verification and Validation.....	21
3.10	Reviews.....	22
	3.10.1 Critical Design Reviews .....	22
	3.10.2 Mission Readiness Reviews.....	23
	3.10.3 ROC Instrumentation Support Brief.....	23
	3.10.4 ROC Instrumentation Readiness Review.....	23
	3.10.5 Approval to Proceed .....	23
3.11	Configuration Management Plan .....	23
3.12	Education and Public Outreach Plan.....	24
3.13	Termination Review Criteria .....	24
3.14	Knowledge Capture .....	25



3.15	Waivers/Deviations Log .....	25
3.16	Change Log.....	25



## **1.0 PART 1: PROJECT OVERVIEW**

### **1.1 Introduction**

The Norway Andøya Space Center (ASC) 2014 Campaign is a NASA Heliophysics Research Division sponsored activity designed to study disturbances in the ionosphere created by interaction of the Sun-Earth connection. This campaign is being conducted at ASC for several reasons, including geographic location, network of ground based instrumentation, and a high probability for visibly active daytime auroras. Scientists involved with these studies will use the ground based instrumentation to conduct part of the ground based research, and to detect specific disturbances in the ionosphere that are targeted for further study. ASC is located within the auroral arc, where these disturbances are more frequent and intense.



For the ASC 2014 Campaign, scientists will first determine the presence of appropriate disturbances using ground based instruments, and then NASA will launch two sounding rocket vehicles and payloads into the ionosphere to make in-situ measurements of the observed phenomena. The launches will take place from ASC which is located at 69° North and 16° East, far north of the Arctic Circle. This high latitude location provides favorable conditions for studying various atmosphere and ionosphere phenomena. ASC has been previously used by NASA for sounding rocket research missions.

This project plan will define the high-level programmatic aspects of conducting this mission. It will focus mostly on the sounding rocket operational aspects of this activity while briefly touching on the scientific aspects that require the support of the Mission Team. The following series of documents, separate from this project plan, will provide detailed support, engineering guidelines, and facilities support.

- Principal Investigator's Data Packages
- Requirements Definition Meeting Data Packages
- Mission Telemetry Requirements
- Flight Requirements Documents
- Joint Instrumentation Plan
- Project Support Plan
- Risk Analysis Reports
- Range Safety Plans
- Go/NoGo Criteria
- Countdowns



## 1.2 Objectives

The objective of these missions is to investigate disturbances in the ionosphere near the auroral cusp. Two separate scientific missions, as described in Section 1.3, will be conducted as part of the investigation. The missions will consist of a series of observations of the ionosphere, conducted by ground based instruments, followed by the sounding rocket launch once specific phenomena are observed. The sounding rocket launch will carry the payload into the ionosphere, which is designed to make in-situ measurements of the observed phenomena. The data collected as part of this investigation will be provided to the Principal Investigator who will be responsible for distribution to co-investigators. The data generated will be documented in appropriate scientific journals and publications.

For each individual mission, specific scientific objectives and mission success criteria (both comprehensive and minimum) are provided by the PIs and documented by memo. The success criteria are also contained in Design Review and Mission Readiness Review documentation. Preparation and control of these documents is the responsibility of the NASA Sounding Rocket Operations Contract (NSROC).

In order to support these objectives, Wallops will provide the launch team access to and successful use of facilities and support systems required to design, build, integrate, test, accept payloads, and to checkout, ship, and launch the sounding rocket launch vehicles and payloads. Successful provision of these services will include:

- Access to all required WFF and ASC work areas in a timely, unencumbered manner.
- Timely access to cranes, lifts, tugs, launchers, and other equipment required to process the vehicle and payload in a safe manner.
- Timely access to functional workspaces (including data and communications capabilities) such as offices, labs, and other work areas for the onsite team.
- Oversight and logistical support of the operations team during lift, integration, and launch preparation to ensure safety and optimal use of facilities and services.

Additionally, Wallops and ASC will provide the mission with reliable tracking, and data acquisition systems to ensure the safe and successful launch of the payload. Successful provision of these services will include:

- Provision of mission-specific telemetry data acquisition per mission requirements.
- Provision of tracking and telemetry data and data analysis products to the customer following launch.



Safety support will be provided for ground and flight elements of the mission sufficient to ensure the safety of the public, on-site personnel, and high value assets. Successful provision of these services will include:

- Development and mitigation of risks associated with ground handling of the vehicles and payloads.
- Development and mitigation of risks associated with flight operations including overflight events.
- Development of detailed ground and flight safety risk analysis reports assessing risks and risk mitigation strategies.
- Development of detailed ground and flight safety data packages provided to the ASC Safety Office.
- Safety Office at ASC will ensure and verify that operational plans are executed in a safe manner, based on the NASA provided data packages.

Project management support will be provided for Range functions sufficient to ensure smooth integration of WFF efforts and responsiveness to customer needs. Provision of these services will include:

- Requirements management of all areas of WFF responsibility.
- Development, maintenance, and execution of integrated schedules, including those NASA-required reviews and milestones required for launch approval from ASC.

### ***1.3 Mission Description***

The NASA Sounding Rocket Program Office (SRPO) is sponsoring the 2014 Sounding Rocket Campaign at ASC. This campaign has two independent launches.

#### **CAPER: (Cusp Alfven and Plasma Electrodynamics Rocket)**

The principal investigator for this mission is Dr. Jim LaBelle, Dartmouth University.

CAPER will establish the role and nature of Alfven wave acceleration in the cusp and discover the causes of the observed differences in the Langmuir waves in the cusp versus the nightside. CAPER also includes the first ever wave-particle correlator measurements in the cusp. The results affect a range of NASA programs in geospace, planetary, heliospheric and astrophysical sciences and are pertinent to multiple objectives of NASA's Heliophysics research program.

One, four-stage Oriole IV launch vehicle will be launched to conduct this mission.





## C-REX: (Cusp Region Experiment)

The principal investigator for this mission is Dr. Mark Conde, University of Alaska, Fairbanks.

This investigation will deploy 24 individual sub-payloads containing Barium and Cupric Oxide. Each canister will be propelled away from the main payload by small rocket motors. At various times, the sub-payloads will then initiate the release of Barium clouds between the altitudes of 150 km and 400 km over the Greenland Sea, west of Svalbard. Ground and aircraft based cameras will then track the clouds to determine the movement of the neutral winds and ion velocities.

One, four-stage Black Brant XIIA launch vehicle will be launched to conduct this mission.

### ***1.4 Customer and Stakeholder Definition and Advocacy***

The ultimate customer for this mission is the NASA Headquarters Heliophysics Research Division, which selected and approved the scientific mission.

The Heliophysics Research Division Program Executive for Sounding Rockets, under which this mission is being conducted, is Mr. George Albright. Operational implementation of this mission is the responsibility of the SRPO, which is part of Goddard Space Flight Center's Wallops Flight Facility. Mr. Philip Eberspecker is the Chief of the SRPO. Project management and on-site operational implementation is the responsibility of the SRPO. Mr. John Hickman has been appointed Campaign Manager (CM) and Ms. Libby West has been appointed Deputy Campaign Manager (DCM) for this mission.

Advocacy for this mission has been obtained at the various levels of NASA management through briefings and technical interchange meetings, which were held with various levels of NASA management. Dr. LaBelle and Dr. Conde will represent their various stakeholders as the PIs of their respective missions by providing customer advocacy and concurrence throughout the planning and execution of the mission. This includes the four major groups of activities:

- Formulation
- Approval
- Implementation
- Evaluation





The PIs, or their representative, will also participate in the following activities:

- Mission Initiation Conference (MIC)
- Requirements Definition Meeting (RDM)
- Payload Design Meetings/telecons
- Design Review
- Integration and Testing
- Mission Readiness Review
- Field Integration and Testing
- Launch Operations
- Mission de-brief
- Customer Survey

### ***1.5 Project Authority***

The lead Center implementing this project is the Goddard Space Flight Center (GSFC). The Suborbital and Special Orbital Projects Directorate, Code 800, located at WFF is the GSFC Directorate specifically responsible for project implementation.

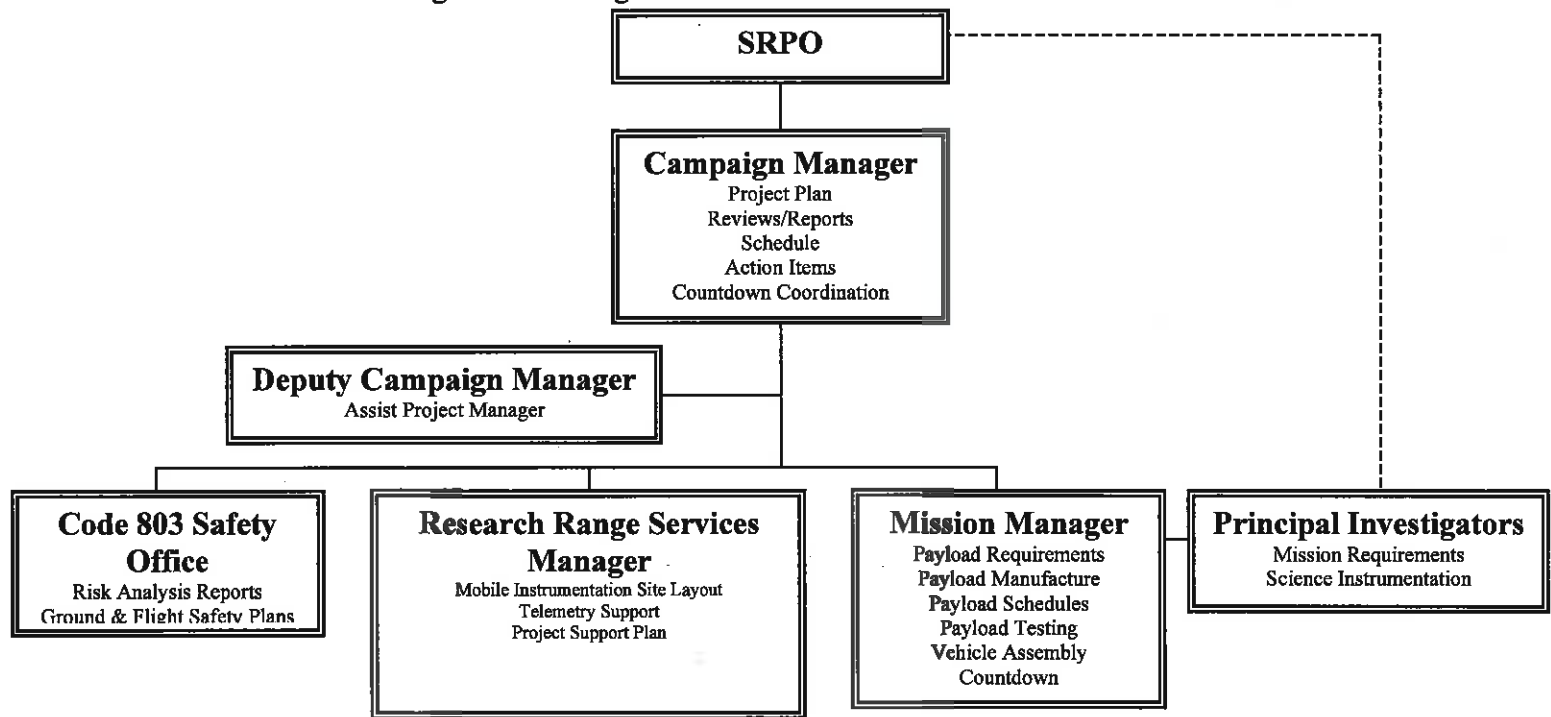
The SRPO, Code 810, located at the WFF, is responsible for implementing the Sounding Rocket Program. The SRPO is responsible for allocating appropriate funds to conduct this mission, for vehicle and payload development (via contract), and for oversight of the mission activities. Additionally, the SRPO is responsible for management and implementation, and is responsible for managing the requirements of the customer and reporting status for all WFF provided elements.

### ***1.6 Management***

The GSFC/WFF PM has full responsibility for this project and is responsible for the safe success of the mission in accordance with NASA procedures, guidelines, and directives. Such procedures, guidelines and directives take precedence over all contractual and other guidelines under which individuals supporting the project may be employed. The ASC missions employs the project management processes as defined in NASA Procedural Requirements (NPR) 7120.8, NASA Research and Technology Program and Project Management Requirements.



The WFF Project Support Team (PST) supports the CM in accordance with NASA procedures and guidelines. The PST membership is formally described using standard form 840-PTAL Form (Project Team Assignment List and Critical Staff List) that will identify PST members by name and role. A diagram of the organization structure and a brief list of the team duties follow.





### 1.6.1 Roles and Responsibilities

The Project Team consists of an integrated team of NASA civil service and support contractor personnel. Each team member, the position on the team, and their contact information is listed in the table below. All questions or issues related to this project should be directed to the Campaign Manager.

Responsibility	Name	Phone
CAPER PI	Dr. Jim LaBelle	(603) 646-2973
C-REX PI	Dr. Mark Conde	(907) 474-7741
Campaign Manager	John Hickman	(757) 824-2374
Deputy Campaign Manager	Libby West	(757) 824-2440
Research Range Services Manager	Steve Kremer	(757) 824-1114
Research Range Chief Engineer	Barton Bull	(757) 824-1893
CAPER Mission Manager	Nate Empson	(757) 824-1546
C-Rex Mission Manager	Jay Scott	(757) 824-1087
Range Safety Engineer	Mike Dook	(757) 824-1414
Flight Safety Analyst	Steve Skees	(757) 824-1097
Ground Safety Analyst – CAPER	Bryan White	(757) 824-2289
Ground Safety Analyst – C-REX	Dave Knight	(757) 824-1035
Operations Safety Specialist	Dave Stiles	(757) 824-2389
Operations Safety Specialist	Dan Graham	(757) 824-2395
Range Services Manager	Scott Bissett	(757) 824-1894
Environmental Engineer	Shari Silbert	(757) 824-2327
ASC Sounding Rocket Manager	Kjell Boen	(+47) 76 14 44 20
ASC Range Safety Engineer	Benny Lysfjord	(+47) 76 14 44 22

The following definitions describe the roles and responsibilities of key project team members:

The Principal Investigator (PI) is responsible for coordinating unique science and operational requirements affecting mission operations and relaying these requirements to the Mission Manager. The PI is responsible for ensuring the ground based science instruments are provided for the experiment in order to meet individual experiment and overall mission science objectives.



The Campaign Manager (CM) is responsible for overall management of the mission, including directing the efforts of the Project Team. The Campaign Manager or designee is the lead NASA official in charge of field operations and is the only official authorized to conduct launch operations on behalf of NASA. Specific responsibilities of the Campaign Manager include:

- Lead NASA official for campaign management and on site operational implementation.
- Safety of all NASA and support personnel in the field.
- Project Plan development.
- Develop and maintain project action item list.
- Develop and maintain project schedule.
- Documentation to ensure mission operations are fully documented and approved.
- Field reporting to management during operations

The Deputy Campaign Manager (DCM) is responsible for maintaining familiarity and insight with all project developments and for supporting the Campaign Manager in project implementation. The Deputy Campaign Manager will assist the Campaign Manager during launch operations in the field as necessary. Specific responsibilities of the Deputy Campaign Manager include:

- Lead NASA official for campaign management and on site operational implementation (when assigned as CM).
- Assist in developing project plan.
- Assist in developing project action item list.
- Assist in developing project schedule.
- Field reporting to management during operations (when assigned as CM)

The Research Range Services (RRS) Manager is responsible for coordinating and directing all aspects of RRS Program range support for the mission. These services include range instrumentation and engineering support required for Sounding Rocket operations support during the mission. All RRS Program contractor-provided service requirements shall be directed to the RRS Manager (or an RRS Manager assigned designee) for the entire mission. The RRS Manager (or an RRS Manager assigned designee) shall be the only person authorized to direct RRS Program contractor-provided services.

The Mission Manager (MM) is responsible for coordinating all aspect of vehicle and payload preparations with appropriate project team members. The MM is the single point of contact to the project team for coordination of all vehicle and payload requirements and activities. Specific responsibilities of the MM include:

- Meeting/implementing mission specific science requirements.
- Meeting/implementing mission specific payload requirements.
- Defining payload development, test, and shipment schedules.
- Ensuring vehicle readiness for shipment.
- Developing countdowns.
- Providing status input to CM and DCM for their payload/vehicle.



The Range Services Manager (RSM) is responsible for providing and/or ensuring the readiness of both the NASA and the range instrumentation elements required for launch operations. This portion of the mission is executed by a combination of Range Operations Contract (ROC) support contractor instrumentation leads and includes elements such as telemetry. Specific responsibilities of the RSM include:

- Preparing the Project Support Plan.
- Ensuring readiness of range support elements including telemetry, and supporting equipment.
- Coordinating site support requirements with ASC Sounding Rockets Manager.
- Coordinating telemetry support with Kongsberg Satellite Services (KSAT).
- Coordinating logistics and shipping with ASC Sounding Rockets Manager.
- Serve as or designate a ROC site leader while in the field.

The ASC Range Safety Engineer (RSE) is the lead ASC official responsible for implementing the ASC Safety program. NASA WFF Safety Office will submit safety data packages to ASC for the mission. The RSE will review, approve, and implement the safety requirements detailed in the safety data packages. The RSE is responsible for coordinating safety requirements with all appropriate agencies and project team members, and is responsible for defining and implementing the safety program at ASC. The RSE will also serve as the Mission Range Safety Officer.

The Flight Safety Analyst (FSA) is responsible for developing the Flight Safety RAR and Flight Safety Data Package. This data will be provided to the ASC RSE for review.

The Ground Safety Analyst (GSA) is responsible for developing the Ground Safety RAR and Ground Safety Data Package. This data will be provided to the ASC RSE for review.

The Operation Safety Specialist (OSS) has authority over all hazardous operations performed during preparation and launch activities. Specific OSS responsibilities include:

- Monitoring (in person) all procedures involving hazardous operations at WFF and ASC: no hazardous procedures will be initiated without OSS knowledge or consent.
- Monitoring on-site conditions subject to safety plans and operating procedure limits and informing the RSE/Mission Range Safety Officer of violations or other related concerns.
- Exercising on-site STOP-WORK authority if deemed necessary to ensure safety.

The Environmental Engineer is responsible for ensuring environmental compliance of mission operations with appropriate federal regulations.

The Resources Analyst provides financial planning and monitoring for the campaign.





### **1.6.2 Management Oversight**

Management oversight of the campaign will be maintained through various status and readiness reviews. Status Reviews will be held with Code 810 and 840 offices as necessary to maintain adequate level of insight/oversight. After launch of each of the missions within the campaign, an “Off the Pad” report will be completed by the assigned MM.

Each mission within the campaign will be subject to several independent Non-Advocate Reviews (NAR’s) such as design reviews, and readiness reviews as defined in the project schedule. These reviews will help ensure the adequacy of mission planning and preparations in meeting project objectives. A list of NAR’s is contained in Section 3.10 of this document.

For NAR’s, the NSROC Mission Manager is responsible for organizing and presenting the development overview and status relating to the vehicle and payload. The Range Services Manager is responsible for organizing and presenting the preparation and status of the range instrumentation. Individual project team members will report on their functional area of responsibility at these reviews.

### **1.7 Governance Structure**

Per NPR-7120 criteria, this mission is a Category III project. This project shall be governed by the Goddard Program Management Council where status shall be reported routinely to the SRPO monthly.

### **1.8 Project Requirements**

The following sections describe at a high level the functional requirements for this campaign and the systems employed to meet these requirements. Individual mission requirements will be provided by the SRPO, Principal Investigators, and NSROC personnel.

The systems and requirements described below are applicable only to launch operations support and specifically identified science operations support at the launch site. Specific technical requirements for operation of ground-based science instruments are outside the scope of this project plan and are the responsibility of the mission specific Principal Investigator, and supporting Co-Investigators.

There are several functional systems required to meet mission objectives. These systems are the ground-based science instruments, several science team provided instruments, the systems comprising the launch site and supporting infrastructure, the range instrumentation systems, and the vehicle/payload systems with their associated hardware.

The operational readiness of the ground-based science instruments and the science team provided instruments falls outside the scope of this project plan. Scientists participating in these investigations will coordinate instrument technical requirements with their co-investigators as appropriate.



The primary responsibility for the NASA provided instrumentation systems (mobile telemetry) belongs to the RSM who is a ROC employee assigned to the project team. The specific systems required to support launch operations and data collection will be defined in the Mission Telemetry Report, which will be prepared and controlled by the NSROC telemetry engineer. The Project Support Plan, which will be prepared and controlled by the RSM, will document the required instrumentation support systems, their launch support configurations, certification testing, and operation plans.

The vehicle and payload systems required for this mission are the responsibility of the NSROC support contractor who is under contract with the SRPO. The Mission Manager is selected by NSROC to manage implementation of the mission. Established processes and procedures, as defined in the NSROC contract, are implemented to ensure the readiness of the individual vehicles and payloads launched as part of the campaign. Range support requirements for all vehicle/payload activities at the launch site are defined by the Mission Managers and incorporated in the Mission Telemetry Requirements for each of the missions.

### ***1.9 Technical Summary***

As previously stated, the ASC 2014 Campaign will involve launching two scientific sounding rockets designed to study disturbances in the earth's ionosphere during auroral activity. Invesitagorst from industry and U.S. Universities will be participating in the research. The sections below provide a technical overview of the ASC 2014 project activities that are necessary to meet the scientific objectives of the missions. Detailed technical specifications/requirements for the mission are addressed in the Principal Investigator's Data Packages.

The payloads are designed and manufactured by personnel associated with NSROC under the guidance of the GSFC SRPO located at Wallops Flight Facility. A NSROC payload team is assigned to each mission and is responsible for the design, manufacture, integration, and test of the payload. The Principal Investigators will provide specific scientific instruments required for their studies, which will be integrated into the payloads and tested at WFF. Standard SRPO/NSROC processes and procedures are followed during this development activity and fall outside the scope of the project team and this project plan. Interface and insight into payload development activities, including project level requirements, definition and scheduling, is provided by the MM assigned to the specific project team.

The project team is responsible for coordination and planning, preparation of the launch site, and for conducting launch operation activities. The launch site selected for this mission is the ASC. ASC is located at 69° North and 16° East, far north of the Arctic Circle. This high latitude location provides favorable conditions for studying various atmosphere and ionosphere phenomena. ASC has been previously used by NASA for sounding rocket research missions.

Launch range preparation and payload development activities will occur simultaneously at their respective separate locations (WFF & ASC). These activities will be completed such that continuous operations are permitted. Once the payload has been successfully integrated and





tested at WFF, they will be prepared for shipment to ASC by the payload team. Upon arrival at the launch site, two to three weeks of assembly and test is required prior to being mated to the launch vehicles. The fully assembled vehicle and payload configurations will be mounted to the launchers.

As launch countdown operations commence, scientists located at the science operations center will monitor ground based observations by radar and/or lidar for the presence of appropriate science conditions. Upon a call from the PI, the project team will initiate final countdown procedures culminating in vehicle launch. Each day of the window, the launch operations team will be at a continual state of readiness to enable launch within several minutes of the call from the PI. The activities are conducted according to specifically scripted countdown procedures to ensure safe and thorough preparation and readiness. As launch proceeds, NASA, ASC, and KSAT instrumentation systems, including telemetry, will track the vehicle and collect data from onboard sensors. The CAPER flight experiment will last approximately 19 minutes and the C-REX experiment will last approximately 13 minutes. All the vehicles and payloads will land downrange in the Norwegian and Greenland Seas, and the Arctic Ocean; there will be no recovery of this hardware. The data gathered during the flight will be provided to the Principal Investigators as soon as practical after launch. The PIs are responsible for further data distribution to Co-Investigators and others as deemed appropriate and for publication of results in appropriate scientific journals and publications.

### ***1.9.1 Project Level Documentation***

The following events must be accomplished for the ASC Campaign.

- United States-Norway Memorandum of Understanding
- Export License
- Project Plan
- Contingency Plan
- Ground Safety Data Package (GSDP)
- Ground and Flight Safety Risk Analysis Reports (RAR)
- Flight Safety Data Package (FSDP)
- Wind Weighting Data Package
- Joint Implementation Plan (JIP)
- Statement of Work (SOW)
- Project Support Plan (PSP)
- Countdowns
- Requirements Definition Meeting (RDM) Documentation
- Design Review Package (DR)
- Mission Readiness Review Package (MRR)
- Record of Environmental Consideration
- Documentation that all reviews and associated actions satisfactorily closed
- Code 800, 803, 810, and 840 concurrence to proceed with launch operations (Authorization to Proceed)



### **1.9.2 System Constraints**

- All ground safety criteria must be met.
- All flight safety criteria must be met.
- Positive communication between all essential personnel is required.

### **1.9.3 Facilities and Ground Support**

The ground systems required to support this campaign fall into two basic categories; launch vehicle & payload support systems and instrumentation support systems.

#### **Facilities supporting launch vehicle & payload support system:**

- Payload Assembly Building (PAB)
- Block House (BH)
- Rocket Assembly Building (RAB)
- Rocket Storage
- Pad 4 Athena 40K Launcher
- Pad 3 U3 Launcher

#### **Instrumentation support systems facilities:**

- Range Administration Center (RAC)
- Science Operations Center (SOC)
- ASC Lidar
- ASC TM
- ASC Doppler Ranging System
- ASC Control Center
- NASA TM Supervan with one 7M antenna
- NASA Mobile Power System
- NASA TM rack stationed at KSAT in Tromso and Svalbard
- KSAT antenna support in Tromso and Svalbard

### **1.9.4 Data Products and Distributions**

All data products will be delivered to the PIs after launch.



### ***1.10 Implementation Approach***

Implementation of the campaign will be the responsibility of NASA/GSFC Code 800 and its support contractors. The SRPO is responsible for overall implementation of the mission. A Mission Team, lead by the Project Manager, has been assembled to implement mission related activities. The implementation responsibility for the mission falls under the NSROC contract, which is managed on behalf of NASA by the SRPO, Code 810. The NSROC Mission Manager is assigned to the mission and is responsible for managing all facets of payload manufacture, test, and launch for the mission.

As previously stated, the science team maintains the responsibility for implementing the instrumentation design and development, and ground-based science instrument preparation and operation. For specific team organization and lead personnel please refer to Section 1.6.

### ***1.11 Program/Project Dependencies***

The dependencies for successful implementation of this campaign are as follows:

- NASA funding for project support
- Science Team development, testing, and operations support of ground based science and payload instruments
- NSROC development, build, launch and flight of payloads
- ROC provided instrumentation, and operational support
- KSAT provided antennas and operational support
- ASC support during preparation and launch.

### ***1.12 Logistics***

Logistics for the campaign is the responsibility of the NASA Code 200 logistics specialist. The Code 200 logistics specialist will coordinate with the CM and team members to address general mission logistical requirements. The ROC RSM will address instrumentation logistics, and the NSROC MM will address payload logistics. Funding for shipping and associated logistics will be provided by the projects within budget guidelines provided by the SRPO and Research Range Services (RRS) for this mission.

Spare hardware for the vehicles and payloads will be supplied by the specific NSROC mission project team. Spares will be included in the payload inventory shipped to ASC by the payload teams. Spare hardware for the range instrumentation will be supplied by ROC and shipped with the instrumentation. Responsibility for sparing for vehicle and payload hardware, and instrumentation fall outside the scope of the Project Plan.



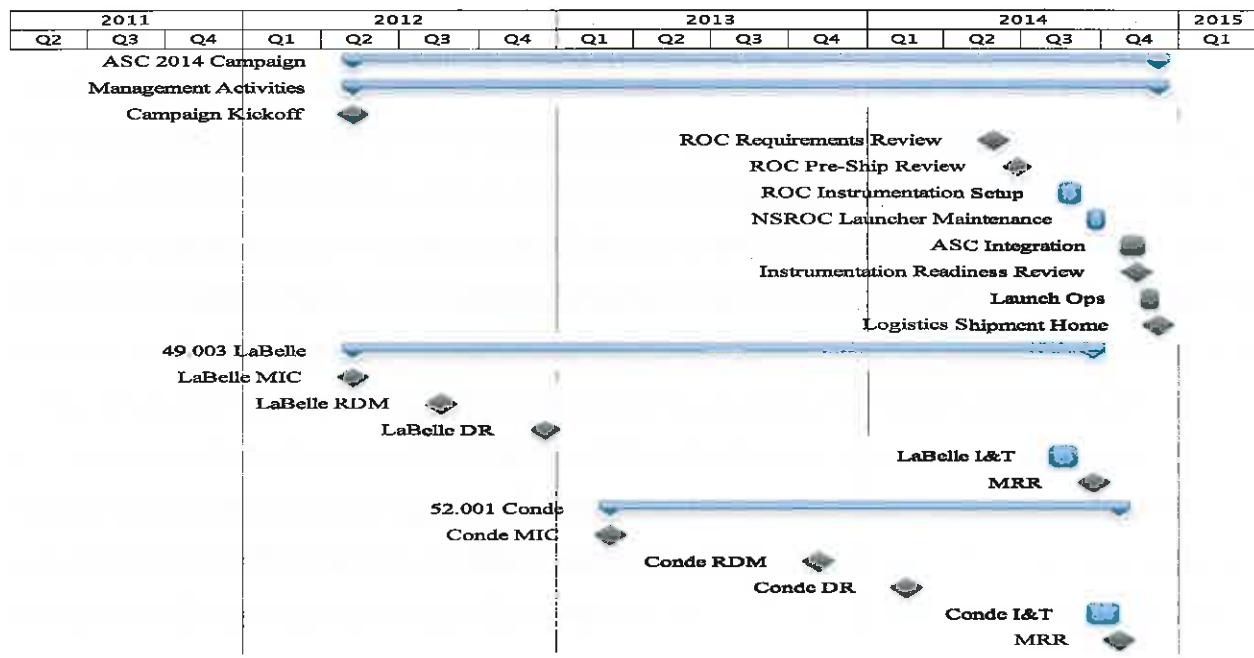
## 2.0 PART 2: PROJECT BASELINE



### 2.1 Schedules

The Project Team will maintain an integrated project schedule. This schedule will integrate payload development activities with range development and mission activities and is maintained by the Campaign Manager or designee. An initial draft of the schedule will be prepared following the NSROC Mission Requirements Definition Meetings and updated as appropriate.

The mission will follow the standard SRPO launch review milestones. Currently the campaign window is scheduled to open November 19, 2014. Any adjustments in this date will cause corresponding adjustments in the dates of other project milestones.



### 2.2 Resources

The CM will manage the budget for this campaign with support of the SRPO Resources Analyst.

Costs that are the responsibility of the mission include shipping of the payload and equipment to the field, travel and lodging expenses, and miscellaneous expenses associated with launch site preparations and operations, including public relations. The budget for campaign expenditures not covered by existing contracts (NSROC and ROC) will come from appropriate SRPO funds.

The costs associated with NASA HQ grants for particular science investigations are the responsibility of the individual Principal Investigators.



### 2.3 Acquisition Management



All services supporting this campaign will be procured using existing contracts with on-site support providers using the following contracts (performance surveillance performed per specification in each contract).

- **Andoya Rocket Range (ASC)** provides the launch facility and related services per the agreement between the United States of America (USA) and the Kingdom of Norway for Cooperation in the Civil Uses of Outer Space, signed on October 23, 2006, by the USA and on October 21, 2006 by Norway.
- **NASA Sounding Rocket Operations Contract (NSROC)** provides mission management, payload design, payload manufacturing and testing, vehicle buildup, launcher maintenance, and operational support per contract NNG10WA17C.
- **Wallops Safety Office Contract** provides flight safety analysis, ground and pad safety support, and ensures institutional safety through compliance with NASA and Occupational Safety and Health Administration standards per contract NNG12WA38C.
- **Wallops Institutional Consolidated Contract/WICC** provides environmental support, and shipping and transportation support per contract NNG14WA44C.
- **Range Operations Contract (ROC)** provides Range instrumentation, engineering, and operations support for the WFF Range per contract NNG10WA14C.
- **Kongsberg Satellite Services (KSAT)** provides TM tracking services at Tromso and Svalbard via sub-contract to ROC.

Vehicle/payload acquisition activities implemented by NSROC are outside the scope of this project plan and are the responsibility of the SRPO and the NSROC contractor.

Instrumentation acquisition activities implemented by ROC are outside the scope of this project plan and are the responsibility of the Code 840, and the ROC support contractor. Acquisitions not covered under the ROC contract will be authorized by the Campaign Manager and the Research Range Services Manager (Code 840) as necessary. Any acquisitions paid for by project funds will be approved by the Chief, SRPO and will remain the property of the SRPO or its support organizations unless otherwise delineated.

### 2.4 Performance

Performance requirements and expected outcomes for this campaign are managed and controlled through technical interchange meetings and the Requirements Definition Meeting. The WFF support contractors are accountable to meeting performance expectations as defined by NASA and their individual contracts.





## **3.0 PART III: SUBPLANS**

### **3.1 Communications Plan**

Specific communications between WFF and non-WFF participants regarding daily campaign activities, safety, and associated risks with the project will be enhanced by the use of:

- Team meetings – as required
- Frequent use of email and telecons
- Mission specific Mission Telemetry Requirements – preliminary at DR, final at MRR
- Mission specific Flight Requirements Plans – preliminary at DR, final at MRR
- Joint Implementation Plans – L-6 months
- Project Support Plan – final at L-2 months
- Contingency Plan – final at L-1 week
- Countdowns – final at L-1 week
- Pre-Mission Briefings and Practice Count – L-1 day
- Progress Reports to Management from the Field - Daily

The NASA CM will retain and manage all relevant project documentation using both physical and electronic folders. Frequent meetings with the project team will ensure appropriate communication of documentation status. All documents will be maintained with version numbers and/or dates to ensure appropriate versioning.

### **3.2 Control Plan**

All changes to governing documents will be approved by the signatories of the particular document. There is no requirement for approval at the Administrator, Associate Administrator, or Center level. Earned Value Management techniques will not specifically be applied. Key milestones, performance parameter completion, and achievement of objectives are the primary method of marking progress. Requirements deviations for non-safety critical elements will utilize the process defined in section 1.4 (Customer Advocacy).

### **3.3 Risk Management Plan**

Risk management is an inherent part of the NASA/WFF Code 800 planning and management. Sounding rocket project risks generally fall into one or several of the following four categories:

- Cost
- Schedule
- Technical
- Safety



The primary risks posed by this project are:

### Funding

Currently, there are no anticipated funding risks for this mission.

### Schedule

The individual mission managers will mitigate the schedule conflicts for these missions to minimize any schedule slip. However, the primary schedule risk is obtaining the appropriate scientific conditions within the launch window.

### Technical

The primary technical risk is TM tracking of the payload. The tracking plan provides one 7M antenna at ASC. If this antenna has problems tracking, valuable data would be lost. Mitigation for this risk includes utilizing the KSAT antennas at Tromsø and Svalbard. The ROC team will deploy ground station equipment at the Tromsø and Svalbard tracking stations to record the data received from the KSAT antennas. This plan worked well supporting the 2007 – 2008 Kletzing and Kintner, the 2010 Lessard, and the 2012 Robertson missions.

### Safety

The primary safety risks involve protecting the public, off range impacts, and participating personnel from the boosters, sustainers, and payloads during re-entry. All of the missions will be analyzed to determine the probability of endangering any of these areas. All safety risks and specific mitigation strategies are described in detail in the risk analysis reports, and the ground and flight safety data packages for the specific missions.

The Campaign Manager and the ASC RSE/Mission Range Safety Officer share equal responsibility to insure that both quantitative and qualitative assessments be conducted and reported. The method for reporting the assessments are signed risk analysis reports, safety data packages, and scalar-based risk tracking methodology. The WFF project risks will consider cost, schedule, technical, and safety risks.

WFF incorporates a scalar-based risk tracking methodology, which tracks risks throughout the life of the project. The risks are identified and listed consecutively as they arise and are tracked according to the following variables:

- Probability of risk (Likelihood)
- Consequences of event
- Criticality derived from matrix of Likelihood \* Consequence





After the risks are identified and ranked they are listed consecutively along with their trend and the approach being employed to resolve the risk. The approaches to mitigate the risk fall into one of four categories:

- Mitigate
- Watch
- Accept
- Research

Details of the risk are further identified by defining each risk as an IF/THEN statement, listing a description of the approach being implemented to address the risk, and the current status. Risk status will be updated monthly and reported to the SRPO Chief.

When the risk becomes a reality (the IF happens), then the risk will then be elevated to a Campaign Issue that will be reported to the SRPO Chief. Campaign Issues are ranked according to a green (low), yellow (medium), and red (high) criticality ranking. An issue statement is developed, which identifies the issue, the impact on the project is stated, and specific actions are established (along with due dates) to resolve the issue.

This campaign will use the standard SRPO Management processes. Weekly and monthly status reports, in combination with reviewing risks at all major reviews, will be utilized for reporting risks. The NSROC Mission Managers will prepare Residual Risk Assessments for their missions and the RMMO RRS Manager will prepare a Residual Risk Assessment for the Range assets. There are no further plans to update the Risks outlined in the Project Plan. No stand alone risk management plan will be developed.

### ***3.4 Technology Strategy or Insertions***

NASA GSFC WFF is not responsible for technology strategies for this mission.

### ***3.5 Cooperation and Commercialization***

These missions are being conducted at ASC per the Agreement between the United States of America (USA) and the Kingdom of Norway for Cooperation in the Civil Uses of Outer Space, signed on October 23, 2006 by the USA, and on October 21, 2006 by Norway.



### **3.6 Safety and Mission Success Plan**

The safety program development and implementation for the campaign is fully covered by Code 800 procedures and guidelines. Safety documentation will be prepared at NASA/WFF and supplied to the WFF and ASC safety offices for review and approval. Once the campaign is underway, on-site safety support will be provided by both NASA/WFF and ASC representatives for ground safety and flight safety support will be provided by ASC.

NASA/WFF Code 800 is responsible for all safety issues within the sounding rocket project lifecycle. Safety is divided into two organizational responsibilities; ground and flight safety. The Code 803 Safety Office manages both the ground and flight safety groups and will assign analysts from each functional area to each mission. The NASA/WFF Range Safety Operations Process for Programs and Projects 803-PG-8715.1 provides an overview of the range safety process and provides detail on the subset ground and flight safety processes. These processes have been tailored to address the unique aspects of the Norway campaign.

The Ground Safety Group within the Safety Office (Code 803) will identify and document the hazardous systems and system safeties, and define the GSFC/WFF safety category for each hazardous system associated with this campaign. Personnel from the Ground Safety Group are also responsible for ensuring that industrial safety requirements are adhered to during preparation and launch activities. The OSS is responsible for implementing the ground safety program for each mission both in the planning phases and during field operations.

The Flight Safety Group within the Safety Office (Code 803) will establish operational hazard areas, flight safety limits, and launch criteria for the launch operations. The ASC Safety Office will be implementing the flight safety program based on the WFF analysis for each mission during field operations.

WFF will prepare Risk Analysis Reports (RAR) for the missions. The RAR's establish the safety program to be employed during the mission. The RAR describes the hazards involved in the mission, documents the safety criteria and preventative measures, and establishes a risk level to be accepted by NASA/WFF and ASC.

In addition to the RAR documentation, NASA/WFF will provide individual Ground and Flight Safety Data Packages for each mission. The Ground Safety Package will address assembly operations, launch pad operations, personnel restrictions, and other hazards unique to our operations. The Flight Safety Package will document restrictions and limitations implemented to ensure the rocket flight is conducted safely. ASC will implement the safety requirements detailed in the safety data packages along with any additional ASC requirements.



### ***3.7 Environmental Management Plan***

An Environmental Assessment (EA) will not be necessary for this mission as it has been determined that our activities fall within the purview of the Sounding Rocket Environmental Impact Statement. There are no additional environmental impacts anticipated.

### ***3.8 Systems Engineering Plan***

NASA Wallops Applied Engineering and Technology Directorate (AETD) will provide the necessary systems and configuration engineering support required for the overall campaign. An AETD Chief Engineer is assigned to support both the SRPO and RMMO. The SRPO Chief Engineer provides oversight for technical aspects of the payload/vehicle development process. The RMMO Chief Engineer provides oversight for technical aspects of the range support instrumentation.

### ***3.9 Verification and Validation***

All vehicle, payload, communication, and support systems are tested prior to launch. Launch vehicle and payload testing and verification are the responsibility of NSROC, which follows standard NSROC policies and procedures. Range testing and verification activities are incorporated into the scheduled countdown procedure developed for the mission.

Payload, vehicle, and range systems testing follow a sequence of five distinct events as follows:

- Payload integration and environmental testing at WFF
- Pack and ship payload and vehicles to launch site
- Assembly, integration, and sequence (functional) testing in payload assembly area at ASC
- Vehicle/Payload mounting and system functional testing on the pad
- Daily operational and functional testing/verification according to countdown procedures

Instrumentation support systems being provided by NASA will be tested prior to departure from WFF and once again following on-site assembly and integration. Instrumentation testing and verification is the responsibility of ROC, which follows standard ROC policies and procedures. Integration and operational testing in the field will be completed during communication and data flow tests during the scheduled launch dress rehearsal.



Instrumentation testing follows a sequence of five distinct events as follows:

- Instrumentation checkout and validation testing at WFF
- Pack and ship instrumentation to launch site
- Setup, checkout, and validation testing at ASC during payload integration
- System functional testing with the Vehicle/Payload on the pad
- Daily operational and functional testing/verification according to countdown procedures

An Independent Technical Authority is not expected for this project, due to the leadership already provided by AETD for this effort. However, if major payload changes or any new launch vehicle configuration is utilized for the project, an independent technical review may be requested.

### ***3.10 Reviews***

Review team results are reported to the Project Manager, the SRPO and RMMO Chiefs, and the WFF Senior Manager, all of whom must certify disposition of findings prior to granting operational approval. Additional detail on named reviews is available in the “Procedural Guidance for Code 800 Reviews” document.

Various project reviews will be completed periodically throughout the lifecycle of this mission in accordance with the overall project schedule. Three formal non-advocate reviews (NARs) will be conducted for the mission. These project level reviews will include:

- Critical Design Reviews
- Pre-Ship Reviews for both ROC instrumentation and NSROC payload/vehicle
- Mission Readiness Reviews
- ROC Instrumentation Support Brief
- ROC Instrumentation Readiness Review
- Approval to Proceed

Individual vehicle and payload reviews, such as preliminary design, critical design, and mission readiness reviews will be conducted by the NSROC contractor according to established plans and procedures. Members of the project team will attend these reviews

#### ***3.10.1 Critical Design Reviews***

The NSROC Mission Managers will lead the CDR for their respective mission following completion of the payload design phase. This review will serve as a status review of the design of the payload and vehicle. The Mission Managers will have responsibility to verify that all action items resulting from this review have been closed.



### **3.10.2 Mission Readiness Reviews**

The NSROC Mission Managers will lead the Mission Readiness Review for their respective mission following completion of the payload integration and testing. This review will serve as the last status review of the payload and vehicle. The Mission Managers will have the responsibility to verify that all action items resulting from this review have been closed.

### **3.10.3 ROC Instrumentation Support Brief**

The RSM will lead the ROC Instrumentation Support Brief prior to deployment to the field. This briefing outlines the planned support for the mission. The RSM will have the responsibility to verify that all action items resulting from this briefing have been closed.

### **3.10.4 ROC Instrumentation Readiness Review**

The Campaign Manager will lead the ROC Instrumentation Readiness Review following completion of the Mission Readiness Review for the mission. The Campaign Manager will have the responsibility to verify that all action items resulting from this review have been closed.

### **3.10.5 Approval to Proceed**

Following the closeout of all Action Items assigned to the project team during the reviews, the Director of Suborbital and Special Orbital Projects will issue a final approval to proceed for launch operations.

## **3.11 Configuration Management Plan**

Section 3.8 outlines the systems engineering and configuration management aspects of the project. The following resources are used at the various levels of to ensure the safety and success of the Project.

### **Mission and Logistics Planning Phase**

- Mission Planning Meetings
- Mission Safety Meetings
- Team Meetings
- Generate
  - Project Plan
  - Payload Design
  - Mission Telemetry Requirements
  - Project Support Plan
  - Countdowns





#### Review Phase

- Critical Design Review
- Pre-Ship Reviews
- Mission Readiness Review
- ROC Instrumentation Support Brief
- ROC Instrumentation Readiness Review
- Approval to Proceed

#### Launch Phase

- Daily Operations during deployment
- The mission specific countdowns
- Daily Reports to Codes 800/803/810/840

#### Evaluation/Performance Phase

- Mission evaluation occurs throughout the life cycle of the mission
- Full and open communications with the project team, science teams, and line management
- Post Mission Brief includes inputs from
  - Principal Investigator
  - Team Members
  - Any Participants including logistic providers
  - Lessons learned
  - Customer Surveys
- Mission Summary Report

### ***3.12 Education and Public Outreach Plan***

The vast majority of educational and public outreach activities for the Sounding Rockets Program are accomplished at the program level via hands-on student launch projects. While no campaign level outreach is specifically planned, project team members are authorized and encouraged to participate in school visits or public lectures during field operations.

### ***3.13 Termination Review Criteria***

Campaign termination could result from a multiple number of events due to the complexity of each mission. As previously stated, instrument design and development, as well as ground-based instrumentation design and operation are the responsibility of the science team. Therefore, these risks are not within NASA/WFF control.

The highest potential for mission termination within NASA/WFF controlled events stem from the technical and cost standpoint.

This project would be the subject of a termination review in the event that either the ground or flight safety analysis indicated the planned launch was unfeasible or inherently unsafe.



### ***3.14 Knowledge Capture***

This campaign will utilize Lessons Learned for knowledge capture and communication. Previous experience obtained on similar missions/campaigns will be incorporated where applicable. Incorporation of knowledge captured will be communicated using project documents, briefs, and reviews.

### ***3.15 Waivers/Deviations Log***

Waivers and tailoring from applicable plans and policies are not currently expected for this mission. In the event that these are required they will be addressed on an as-needed basis. Any alterations to this document following release, review and acceptance, will be shown in the change record sheet of this document. In addition, all involved parties will be notified of the change.

### ***3.16 Change Log***

Changes to the Project Plan shall be documented in the change log.